

Appln No. 10/529,585
Reply to Office action of April 19, 2006

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REMARKS/ARGUMENTS

Claims 1 to 22 are pending in this application. With this amendment, claim 1 has been amended, and claims 2, 4, 7 and 20 have been cancelled. No new subject matter has been introduced with these amendments.

Double Patenting Rejection

The Examiner rejects claims 1 to 22 under the judicially created doctrine of nonstatutory double patenting. Although Applicants disagree with the substance of the rejection, to speed prosecution Applicants will file a terminal disclaimer in compliance with 37 CFR 1.321(c) to overcome this rejection once allowable subject matter has been indicated.

Rejections Under 35 U.S.C. § 102

The Examiner rejects claim 19 under 35 U.S.C. § 102 as being anticipated or obvious in view of either JP 2002-45960A or U.S. Patent No. 6,491,592 to Cackett et al. Applicants respectfully traverse this rejection.

First Applicants are submitting herewith a machine translation of the "detailed description" and "claims" sections of the cited Japanese patent, as obtained from the official Japanese Patent Office website. Applicants do not warrant or attest to the accuracy of this translation, but merely wish to increase the Examiner's understanding of the context of the cited Abstract.

Turning to the rejection, Applicants understand the Examiner's reference to MPEP §2113 to indicate that he believes that the product of the claimed process would be identical to any product made in accordance with the processes described in the cited prior art references, and that thus they are rejected on this basis. Applicants have amended the claims to further include the requirement that the product have a "defining ratio" within certain parameter ranges. As extensively described in the specification this "defining ratio" is based on Applicant's discovery that using the inventive process it is possible to form parts having dimensions currently unobtainable with amorphous materials. The Japanese patent makes no reference to such dimensional capabilities,

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and the Cackett patent specifically restricts an amorphous alloy piece to an aspect ratio between 1.0 and 1.7 (col. 11, lines 34 to 35), this corresponds to a "defining ratio" between 0.58 and 1.0. Accordingly, Applicants submit that neither the Japanese patent, nor the patent to Cackett et al. anticipate, or would have rendered obvious claims 19, 21 or 22 of the current application, and respectfully request reconsideration of this rejection.

Rejections Under 35 U.S.C. §103(a)

The Examiner also rejected claims 1-18 and 19-20 under 35 U.S.C. §103(a) as being unpatentable over any of Cackett, et al., Japanese Patent No. 2002-45960, or over any of three patents to Peker et al. (U.S. Patent Nos. 6,771,490; 6,843,496; or 6,887,586). Applicants respectfully traverse these rejections as well.

First with reference to the cited Cackett ('592) patent. This reference does not actually teach any relevant methodology for investment casting of amorphous alloys. Rather, in one disjointed section, the authors provide a laundry list of possible forming techniques, including forging, investment casting and casting, machining, super-plastic forming, etc.; and in the same section provide another laundry list of possible materials including titanium and alloys, stainless steel, amorphous metals, vitreous metals, etc. (See, e.g., Cackett et al. col. 10, line 60 to col. 12, line 19.)

Nowhere in this section do Cackett et al. ever teach or even suggest that one could Investment cast an amorphous alloy, much less provide an actual set of processing steps for doing such. Moreover, Cackett et al. actual state that "the metal for forging or casting is preferably titanium or titanium alloy" (Cackett et al., col. 10, line 67 to col. 11, line 3.) Accordingly, Applicants do not believe that one of ordinary skill in the art would have been motivated to use investment casting, a technique with processing conditions that are seemingly contrary to the entire notion of a fast cooling material, and applied it to amorphous alloys, a material notorious for its fast cooling requirements. (For a full discussion of the incompatibilities of conventional investment casting with amorphous alloys see Specification, page 4, line10 to page 6, line5, and particularly the last paragraph of this section that describes the slow cooling method

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generally used in investment casting.) In light of these deficiencies Applicants respectfully request reconsideration and withdrawal of this grounds for rejection.

Applicants also submitted herewith a machine translation of the Japanese Patent cited by the Examiner. As shown, the Japanese reference actually does mention a quenching step. However, the process used in the cited Japanese patent is in direct contradiction to the teaching of the current application. The current application is directed to a method of investment casting that requires that the molten metal be first introduced into the mold, followed by quenching the mold in a quenching medium. This is reflected in the amended claims that require that the investment mold be heated during the introduction of the amorphous feedstock. It is only after this introduction that the investment mold is quenched by being contacted with a "quenching medium."

In contrast, the Japanese Patent requires that the investment mold be cooled to a temperature below the "crystallization temperature" of the amorphous material during the introduction of the material. For example, the Japanese patent states:

[0010] That is, invention of this application claim 1 publication is the casting approach of the amorphous alloy characterized by cooling said mold below to the crystallization temperature of said amorphous alloy, and casting a dissolution metal in the casting approach which casts the dissolution metal of the presentation which has amorphous organization potency to the mold manufactured by the lost wax process, and makes it an amorphous alloy.

(Japanese Patent No. 2002-045960A, Paragraph 0010, emphasis added.)

Accordingly, one of ordinary skill in the art, having read the Japanese patent would have thought it necessary to quench the investment casting mold prior to introducing the material into the mold. This is in direct contradiction to the teaching of the current invention.

In light of these contradictory disclosures, Applicants submit that one of ordinary skill in the art having read the Japanese Patent would have had no motivation to repeat the claimed investment casting process, and would have indeed been directed away

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from such a method. As such, Applicants also respectfully request reconsideration and withdrawal of this rejection.

Rejections In View of "Routine Experimentation"

Finally, turning to the Examiner's rejections over all of the cited art, including the patents to Peker et al., Applicants have amended claim 1 to include further specify the processing parameters required for the current investment casting method that were originally included in claims 2, 4 and 7. The Examiner repeatedly states in his Office action that such parameters, although not disclosed in any of the cited references, would have been obvious to obtain though routine experimentation. Applicants strongly disagree with this argument.:

Through the instant disclosure, Applicants are giving instructions on how to conduct investment casting for a variety of amorphous alloy systems in order to substantially reduce the "prohibitive" experimentation that would be necessary to determine the appropriate conditions, conditions that the Examiner calls "routine". Second, the parameters provided in the instant application (e.g. superheating, ΔT , the thickness of the investment shell, etc.) are truly not obvious, and indeed in some instances are counter-intuitive (i.e., superheating the shell) for one skilled in the art of investment casting. Finally, each parameter used is completely distinct from the other, and would therefore require one skilled in the art to experiment with a number of different parameters to find the right combinations, which is certainly not routine.

Accordingly, Applicants submit that the Examiner's use of "common knowledge" and "routine experimentation" to reject the dependent claims is improper. Specifically, through this rejection the Examiner effectively states that finding the appropriate ΔT_{sc} range, the thickness of the investment mold, the critical cooling rate of the amorphous material, the enthalpy of crystallization of those materials, and the defining ratio of an article formed through the process are each "obvious to obtain . . . though routine experimentation." (Office Action, page 6 to 7.) The MPEP sets forth the proper procedure for relying on common knowledge stating:

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The standard of review applied to findings of fact is the "substantial evidence" standard under the Administrative Procedure Act (APA). See *In re Gartside*, 203 F.3d 1305, 1315, 53 USPQ2d 1769, 1775 (Fed. Cir. 2000). See also MPEP § 1216.01.

...

It would not be appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known. For example, assertions of technical facts in the areas of esoteric technology or specific knowledge of the prior art must always be supported by citation to some reference work recognized as standard in the pertinent art. *In re Ahlert*, 424 F.2d at 1091, 165 USPQ at 420-21.

The MPEP goes even further stating:

It is never appropriate to rely solely on "common knowledge" in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based. *Zurko*, 258 F.3d at 1385, 59 USPQ2d at 1697 ("[T]he Board cannot simply reach conclusions based on its own understanding or experience—or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings.").

In short, the MPEP concludes that:

The examiner must provide specific factual findings predicated on sound technical and scientific reasoning to support his or her conclusion of common knowledge. See *Soli*, 317 F.2d at 946, 37 USPQ at 801; *Chevenard*, 139 F.2d at 713, 60 USPQ at 241. The applicant should be presented with the explicit basis on which the examiner regards the matter as subject to official notice and be allowed to challenge the assertion in the next reply after the Office action in which the common knowledge statement was made.

In the current case the Examiner makes no such showings, instead merely asserting that the listed parameters would be a mere matter of "optimization", despite the fact that there is no teaching in any of the cited references that would even suggest to one of ordinary skill in the art to that any of these parameters would be important to creating an effective investment casting process. Rather the Examiner makes the

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broad statement that these are all simply "optimal process parameters." Applicants strongly disagree with this conclusion.

While the Examiner is correct that the MPEP provides that simple "result effective variables" can be the subject of "routine optimization", the types of variables that fit within this category are very circumscribed. For example, the MPEP sets forth that in order to be considered a variable capable of "routine optimization" the variable must be recognized as achieving a particular result, stating:

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.).

In the current case nowhere does the prior art suggest that finding the appropriate ΔT_{sc} range, the thickness of the investment mold, the critical cooling rate of the amorphous material, the enthalpy of crystallization of those materials, or the defining ratio of an article formed through the process would "achieve the result" of changing the effectiveness of the conventional investment casting technique. Indeed, the prior art does not even mention these parameters, much less teach how these parameters might effect the investment casting process. Indeed, given the lack of any disclosure on the subject one skilled in the art would be forced to undertake a number of different inquiries to obtain the claimed subject matter. First one skilled in the art need to find which parameters are important in the infinite domain of parameters, and then would need to find the right range of values for each of those parameters.

Accordingly, Applicants submit that the Examiner must provide evidence from the prior art that would show that these listed parameters were considered capable of achieving the result of modifying the conventional investment casting procedure set forth in the prior art to sustain the current rejections on the basis of "common

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knowledge" and "routine experimentation." Absent such a showing Applicants respectfully submit that the current claims cannot be said to be unpatentable in light of the cited prior art.

Conclusion

In view of the foregoing amendment and response, it is believed that the application is in condition for allowance and, accordingly, reconsideration and allowance is earnestly solicited.

If any questions remain regarding the allowability of the application, Applicant would appreciate if the Examiner would advise the undersigned by telephone.

The Commissioner is hereby authorized to charge any fees under 37 CFR 1.16 and 1.17 which may be required by this paper to Deposit Account No. 03-1728. Please show our docket number with any charge or credit to our Deposit Account.

Respectfully submitted,

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